Passenger Rail Corridor Study
Tucson to Phoenix

PROJECT INITIATION PACKAGE

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1.0 INTRODUCTION

This Project Initiation Package contains an overview and status update of the Phoenix-Tucson Intercity Rail Study, and provides early project information to the Federal Transit Administration (FTA) and Federal Railroad Administration (FRA) to develop a major transit capital investment within the Arizona Sun Corridor, as identified in the following regional and state planning documents:

- *ADOT 2050 Statewide Transportation Planning Framework;*
- *ADOT Statewide Rail Framework Study;*
- *Arizona State Rail Plan;*
- *MAG Regional Transit Framework Study;*
- *MAG Central Phoenix Framework Study;*
- *MAG Regional Transportation Plan;*
- *PAG 2040 Regional Transportation Plan; and,*
- *Pinal County Comprehensive Plan and others.*

The Arizona Department of Transportation (ADOT) is continuing study of high capacity regional transportation to move passengers between the Cities of Phoenix and Tucson. This study builds on previous work performed by ADOT and other agencies. Because federal funds are being used to fund the work program defined herein, and federal funds will likely be sought to help implement a preferred alternative, an environmental document is proposed to satisfy requirements of the National Environmental Policy Act (NEPA). NEPA applies to projects requiring federal actions.

The Federal Railroad Administration (FRA) and Federal Transit Administration (FTA) are providing funds for this study. The agencies are designated as co-federal lead agencies for the study process. NEPA contains certain requirements that all federal agencies must follow. However, the specific process for moving a project from a universe of alternatives to a preferred alternative and implementation of the environmental evaluation somewhat differs for each agency.

This project is designed to meet both FRA and FTA requirements to recommend a preferred alternative for a fixed guideway project to meet the need for intercity connectivity overlaid with a need for commuter mobility within the same study area.

The solution pertaining to intercity connectivity is managed by FRA, and the typical approach includes an evaluation of alternatives during the completion of a Tier 1 Environmental Impact Statement (EIS), also known as a Service Level EIS. The Council on Environmental Quality (CEQ) refers to this as a programmatic EIS. A Tier 1 EIS for FRA purposes typically addresses broader questions relating to the type of service(s) being proposed, including cities and stations served, route alternatives, service levels, types of operations (speed, electric, or diesel powered, etc.), ridership projections, and major infrastructure components. For a major corridor improvement program, this type of environmental review must be completed before any substantial investments in the corridor can be made. Following the completion of the Tier 1 EIS, a Service Development Plan is completed that documents various performance measures of the recommended alternative and details an implementation plan.

The solution(s) pertaining to commuter mobility is managed by FTA. For projects with many possible alignments and technologies, FTA typically requires an Alternatives Analysis (AA) to be completed

outside the NEPA process with the purpose of screening the universe of alternatives in order to identify a Locally Preferred Alternative (LPA). NEPA scoping is initiated after the selection of an LPA so that the EIS can focus on the evaluation of a preferred alternative(s), No-Build, and Baseline alternatives. [The Baseline is usually a transportation systems management (TSM) alternative.]

The intent of this project is to prepare an AA document that would be compatible with a future New Starts process in conjunction with a Tier 1 EIS to satisfy both the FTA and FRA approaches to selecting a preferred/recommended alternative for implementation. It is designed to provide the work needed to fulfill requirements for an FTA New Starts AA and FRA Tier 1 EIS and Service Development Plan. For FTA purposes, a project level NEPA process could, at ADOT's discretion, be initiated after the scope of services is completed. For FRA purposes, the Service Level NEPA document requirements will be satisfied. However, the Project Level NEPA EIS, or Tier 2 EIS, could be initiated, at ADOT's discretion, after this scope of services is completed. Table 1 documents how the proposed ADOT Phoenix-Tucson Rail Study is responsive to the FTA AA and FRA Tier 1 EIS processes.

Table 1. Proposed AA/Tier 1 EIS Process

Task	Proposed ADOT PHX-TUC Rail Process	
	Proposed Approach	Response to Federal Process
Project Initiation	Publish a Notice of Intent (NOI) for a Tier 1 EIS	Initiates a service level EIS process (FRA)
Problem Statement	Purpose and Need	Identifies the transportation need for intercity connectivity between Phoenix and Tucson (FRA) Identifies the transportation need for commuter mobility within Maricopa, Pinal, and Pima counties (FTA)
Alternatives	Prepare an Alternatives Analysis and a Service Development Plan supported by a Tier 1 EIS that are compliant with FRA and FTA New Starts requirements	Review of a full range of Intercity alternatives including end of line locations within each urban area, potential route locations, and service development issues (FRA) Review of Commuter alternatives including a full range of mode options, connectivity scenarios, route locations, and travel market performance measures. (FTA)
Public and Agency Involvement	Conduct a Public Involvement Plan and Agency Coordination Plan which supports the decision of a Locally Preferred Alternative	Conduct a public and agency outreach plan that meets the requirements of a Tier 1 EIS document including Public and Agency Scoping and Public Hearings (FRA) Follow a Public Involvement Plan that supports a New Starts AA study, and an Agency Coordination Plan that meets the requirements of SAFETEA-LU 6002. (FTA)
Deliverables	New Starts Alternatives Analysis Tier 1 Environmental Impact Statement Service Development Plan	FRA, FTA, and Local Approval
	Tier 1 Record of Decision (ROD) and LPA	
Next Steps	To be determined based on future funding strategy	

1.1 Study Description and Project Background

The study, which kicked off in March 2011 (expected to last about 30 months), consists of an Alternatives Analysis/Tier 1 EIS and Service Development Plan to evaluate potential high capacity transit improvements in the Phoenix-Tucson study area. The Phoenix and Tucson areas are separated by a distance of approximately 120 miles. The proposed Phoenix–Tucson Intercity High Capacity Transit Corridor (Corridor) is bounded by three counties: Maricopa, Pima, and Pinal (see Figure 1).

Phoenix and Tucson are the two largest metropolitan areas in Arizona, representing about three-quarters of the state's population. In addition, approximately 9 out of 10 jobs in the state are found in these two metropolitan areas. With the recent population growth in the region between the two metropolitan areas, several statewide and regional planning processes (documented in the introduction) have identified a need for increased transportation capacity between these metropolitan areas.

In March 2010 ADOT completed the *Statewide Transportation Planning Framework,* which concluded that Arizona cannot address future congestion by continuing to rely almost exclusively on roadways to move people and goods. Rail offers a highly sustainable form of transportation that is more environmentally friendly and a resource sensitive method of moving goods and people, and this study intends to investigate the benefits of this alternative mode of travel.

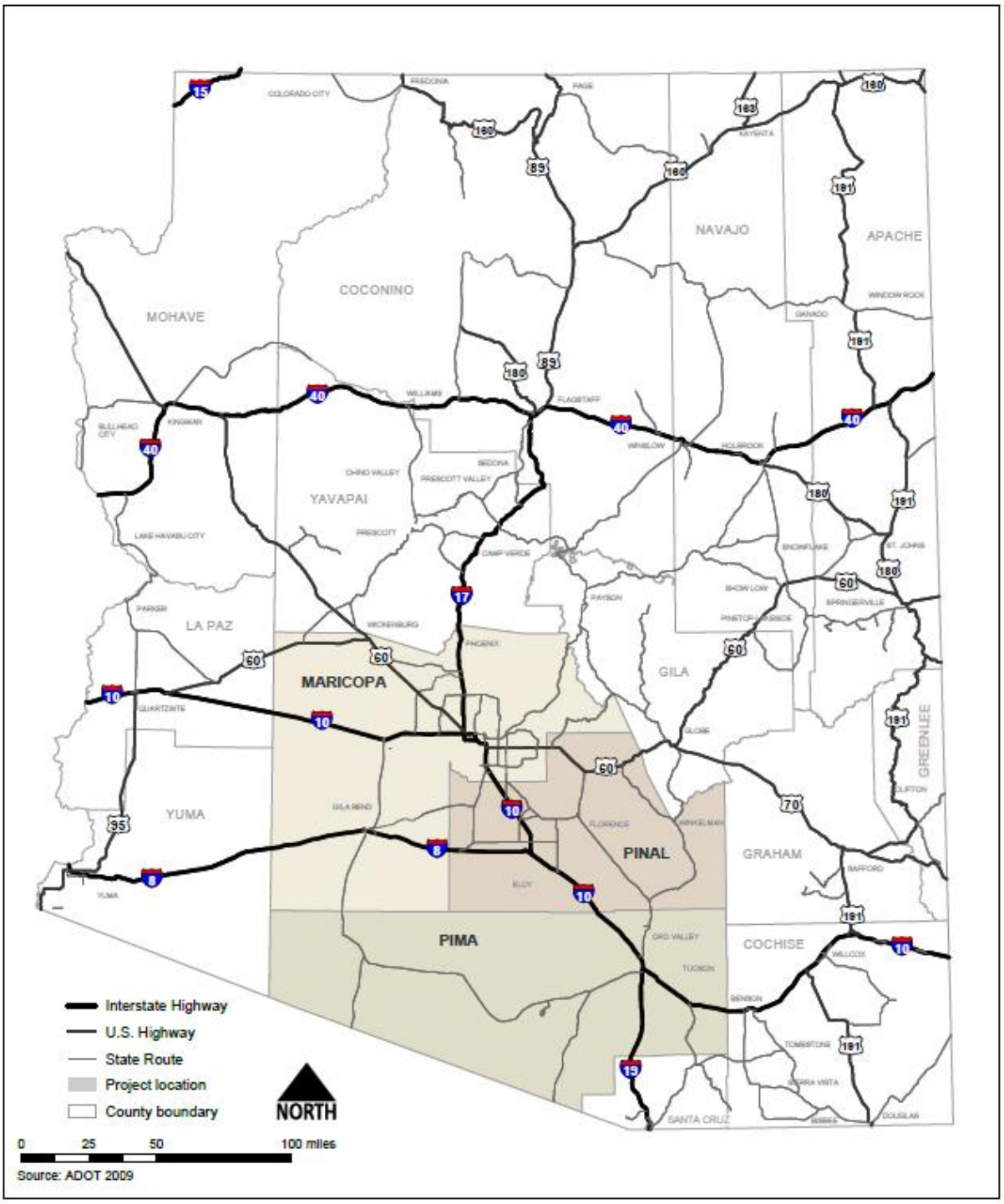
The Alternatives Analysis/Service Development Plan is being completed to identify a preferred alternative to address the already high and growing travel demand within the study area.

1.2 Project Purpose

The draft statement of project purpose is currently under review by ADOT, and will be refined further. In its current state, the purpose is defined as follows:

1. Identify a transportation alternative that increases efficient access to employment opportunities in Maricopa, Pima, and Pinal counties.
2. Identify a transportation alternative that provides reliable travel times and safe travel in a congested highway environment as predicted in several previous studies.
3. Identify a transportation alternative with a recommended alignment and technology to connect the suburban and rural areas located adjacent to and between the Phoenix and Tucson metropolitan areas with reliable travel times.
4. Identify a widely-supported transportation improvement that would facilitate continued development of a comprehensive, multimodal and inter-connected regional/multi-regional transportation network that offers effective mobility choices for current and future needs. This ensures that should intercity passenger services be contemplated in the future for extension beyond the Phoenix to Tucson corridor, connectivity to other systems or an extension to other areas would be better facilitated.
5. Identify a transportation alternative that ensures enhanced connectivity among existing and planned regional and local activity centers located in Maricopa, Pima, and Pinal counties.

Figure 1. Phoenix-Tucson Intercity Rail Study – Study Area



1.3 Coordination

A kick-off meeting for the Phoenix-Tucson Intercity Rail Study, coordinated by ADOT, was held on March 10, 2011. The kick-off meeting introduced the study to participating agencies and stakeholders. In addition to the kick-off meeting, study coordination meetings have been held with Maricopa Association of Governments (MAG), Pima Association of Governments (PAG), and other participating agencies. Kick-off meeting participants and other stakeholders also participated in one of three preliminary stakeholder meetings in June 2011. The purpose of the meetings was to solicit input on purpose and need, alternatives, and, evaluation methodology. The meetings were held on June 21, June 23, and June 28 (2011), with one meeting each in Maricopa, Pima, and Pinal counties.

A Project Management Team (PMT) consisting of representatives from the FHWA, FTA, FRA, MAG, PAG, and Central Arizona Association of Governments (CAAG) will meet quarterly throughout the Phoenix-Tucson Intercity Rail study to help guide the proposed FTA AA and FRA Tier 1 EIS processes to be completed as part of this study. The initial PMT meeting was held on April 20, 2011. The next meeting is scheduled for July 26, 2011 which will address the contents of this document. In addition to the PMT, technical advisory/coordination meetings are held bi-weekly with ADOT staff and study consultants to ensure coordination of the technical work effort.

ADOT will conduct a concurrent Public Involvement Program. A draft SAFETEA-LU 6002 Coordination Plan has been developed to guide the public involvement process. The draft Coordination Plan will be submitted to FRA and FTA for review, along with a Notice of Intent (NOI). A preliminary list of participating agencies, project stakeholders and elected officials, along with a schedule of initial stakeholder meetings have been developed, and are under review by ADOT. A Project Fact Sheet, which is currently under development in consultation with ADOT, will be distributed in coordination with Scoping Meeting notification. Notification will consist of direct mailing, e-mail blasts, telephone communications, and direct delivery of meeting notifications and other study related materials.

1.4 Project Deliverables

To meet the objectives of the FTA and FRA planning processes, this study will produce deliverables that will meet the expectations for:

1) an FTA New Starts compliant Alternatives Analysis (AA)
2) an FRA compliant Tier 1 EIS and Service Development Plan (SDP)

There is an identified need for both commuter and intercity service along the entire corridor and both needs will be addressed concurrently as the study progresses. The intent is that the deliverables will reflect the requirements of both federal agencies in a combined set of documents that will satisfy FTA New Starts AA and FRA SLEIS/SDP needs. This process provides flexibility for Arizona agencies to advance implementation of the preferred alternative by several funding scenarios, including FTA Section 5309 New Starts funding, and/or FRA High Speed Intercity Rail funds.

Alternatives Analysis – The purpose of the AA is to identify transportation problem(s) in a corridor or study area, determine the underlying causes of the problem(s), and analyze viable options (alternatives) that may address the identified problem(s). As part of the AA, measures such as feasibility, cost, benefits, equity, etc. are compared to identify a LPA.

Tier 1 EIS – A Tier 1 EIS provides a NEPA compliant document that includes the appropriate level of information to determine corridor-level decisions and address related issues of concern. The Tier 1 EIS will document and confirm the purpose and need, identify a range of alternatives to be analyzed (including alignments, technology, and service operations), identify/develop evaluation criteria, document environmental impacts, identify a preferred alternative for the corridor/study area alignment, and address component projects for a Tier 2 assessment to increase capacity for travel along the selected corridor.

Service Development Plan – A service development plan provides a conceptual operations plan associated with a preferred alternative. The SDP provides an operating plan (trip patterns, schedules, etc.), capital plan (vehicles, guideway, stations, etc.), cost estimates and ridership projections. In addition, the SDP includes implementation considerations such as a project management plan, financial plan, maintenance plan, risk assessment, and stakeholder agreements.

2.0 PROBLEM STATEMENT

This section provides a brief description of the early research results completed to date, and serves as the preliminary Purpose and Need Statement. The need for potential commuter rail and intercity rail is defined based on existing and potential travel patterns, existing passenger service availability and performance, travel time, population, employment, land use and economic development trends. As the travel demand analysis associated with the AA progresses, a comprehensive Purpose and Need Statement will be finalized with in-depth, detailed discussion of the topics presented in this section of the Project Initiation Package, as well as discussion of more detailed analysis.

2.1 Problem Identification

Existing and future travel patterns, existing transit services, travel times, and population and employment growth in the study area all demonstrate an existing and evolving mobility need. The travel demand in the corridor identifies a number of study area markets where demand exists today or will exist in the future based on travel forecasts. The distinction between the demand for intercity connectivity and commuter mobility needs will be identified as part of this study through analyzing travel demand volumes, trip origin and destination, trip purpose, trip frequency, and time-of-day travel patterns.

Table 2 and Table 3 identify the proposed approach for defining the intercity and commuter transportation needs within the study corridor.

Table 2. Intercity Travel Market

Task	Definition of Intercity Transportation Need (FRA)	
	Deliverable	Proposed Approach
Project Initiation	NOI	Disclose the transportation need for improved Intercity connectivity between Phoenix and Tucson in the published NOI
Problem Statement	Purpose and Need	Research existing travel modes that provide intercity service between Phoenix and Tucson, including private auto, common carrier, and commercial air service Document the impacts to regional mobility between Phoenix and Tucson based on the projected growth of the Sun Corridor Evaluate the impacts of increased demand along the Interstate10 corridor on travel time reliability
Public Involvement	Public and Agency Scoping as required to support Tier 1 EIS	Solicit input from the public and agencies pertaining to the need for improved intercity connectivity during the scoping process required by NEPA.

Table 3. Commuter Travel Markets

Task	Definition of Commuter transportation need (FTA)	
	Deliverable	Proposed Approach
Project Initiation	NOI	Disclose the transportation need for improved commuter mobility within and between Maricopa, Pinal, and Pima counties in the published NOI
Problem Statement	Purpose and Need	Research future travel markets within and between the Phoenix and Tucson metro areas and expansion over time into Pinal County Document the change in travel based on population and employment growth in Pinal County
Public Involvement	Public and Agency Scoping as required to support Tier 1 EIS	Solicit input from the public and agencies pertaining to the need for improved commuter mobility during the scoping process required by NEPA.

By 2050, the employment and population makeup of the Sun Corridor will be substantially different from 2011. By 2050, the Sun Corridor is projected to be one of 11 megaregions across the United States that will account for the majority of the country's future growth. In 2050, while the Phoenix and Tucson areas will continue to be major population and employment centers, the area between Phoenix and Tucson will experience tremendous population and employment growth creating a singular urbanized corridor spanning Maricopa, Pinal and Pima Counties. With a projected population nearing 12 million people by 2050, the urbanized corridor will be characterized by dense employment and population centers in and around Phoenix and Tucson and similar population and employment centers throughout Pinal County.

Based on anticipated changes, the Sun Corridor will require corridor-wide intercity and commuter services to address mobility needs as it evolves between now and 2050.

Mobility between Phoenix and Tucson is affected by growing congestion within the Interstate10 Corridor. Future expansion of the freeway and the construction of an additional North-South Corridor freeway will be insufficient to accommodate the anticipated demand based on forecasts from studies in the Sun Corridor. As Pinal County grows, conditions will cause an unacceptable increase in the time to travel between Phoenix and Tucson by 2050.

Currently, the only transportation modes available for travel between Phoenix and Tucson are private auto, common carrier (bus), limited commercial air service, and ridesharing; with the vast majority of commuter, regional, and intercity travel using Interstate 10 (Section 2.2 provides a summary of the available passenger service modes in the study area). Despite recent widening of sections of the freeway in the study area, Interstate 10 experiences increasing durations of severe congestion and failing operation.

The 2050 projected travel demand in the Sun Corridor is expected to have a significant adverse effect on the megaregion's surface transportation network. A comparison of 2010 travel times with those modeled by a statewide travel demand model for 2050 indicates peak-hour travel times would increase by over 100 percent for most trips, resulting in lost time and productivity. For example, the duration of a trip from Phoenix to Tucson—which now takes approximately 105 minutes under free-flow conditions—

would increase to nearly 5½ hours by 2050. This assumes Interstate 10 has been widened to ten lanes during this period and the North-South Corridor freeway is built linking East Mesa and Eloy.

Further, the continued and growing demand to use Interstate 10 as the primary intercity route in the corridor will contribute to increasing congestion, and reduced dependability of the facility. As demand to use Interstate 10 grows, traffic collisions are expected to increase which would further reduce the overall effectiveness of Interstate 10 as a high capacity regional facility serving intercity needs. In lieu of increasing capacity through continued highway widening, capacity afforded by alternative modes could help improve mobility for existing and future travel markets by providing additional transportation capacity unaffected by highway conditions.

There is existing demand for commuter services within and between the Phoenix and Tucson metro areas. That demand will grow in the future. As Pinal County reaches its build-out in 2050, commuter activity will expand the urbanized areas between Phoenix and Tucson with major trip interchanges between Maricopa and Pinal and between Pima and Pinal Counties. Travel markets that will need to be served by a commuter services will include:

1) Commuter travel within and between Phoenix and suburban communities extending into Pinal County
2) Commuter travel within and between Tucson and suburban communities extending into Pinal County
3) Commuter travel within and between activity centers in Pinal County and Phoenix Metropolitan Area
4) Commuter travel within and between activity centers in Pinal County and Tucson Metropolitan Area

Statewide, Arizona's population is projected to more than double in the next 40 years, from 6.4 million to 16 million, with most of the increase resulting from growth within the megapolitan region. Forecast population changes in the Sun Corridor are:

- Maricopa County population is projected to increase by 90 percent from 4,023,000 in 2009 to 7,622,700 in 2050
- Pima County population is projected to increase by 96 percent from 1,018,000 to 1,990,300 by 2050
- Pinal County population is projected to increase by 494 percent from 356,000 to 2,113,000—the highest growth rate of any identified megapolitan region in the nation.

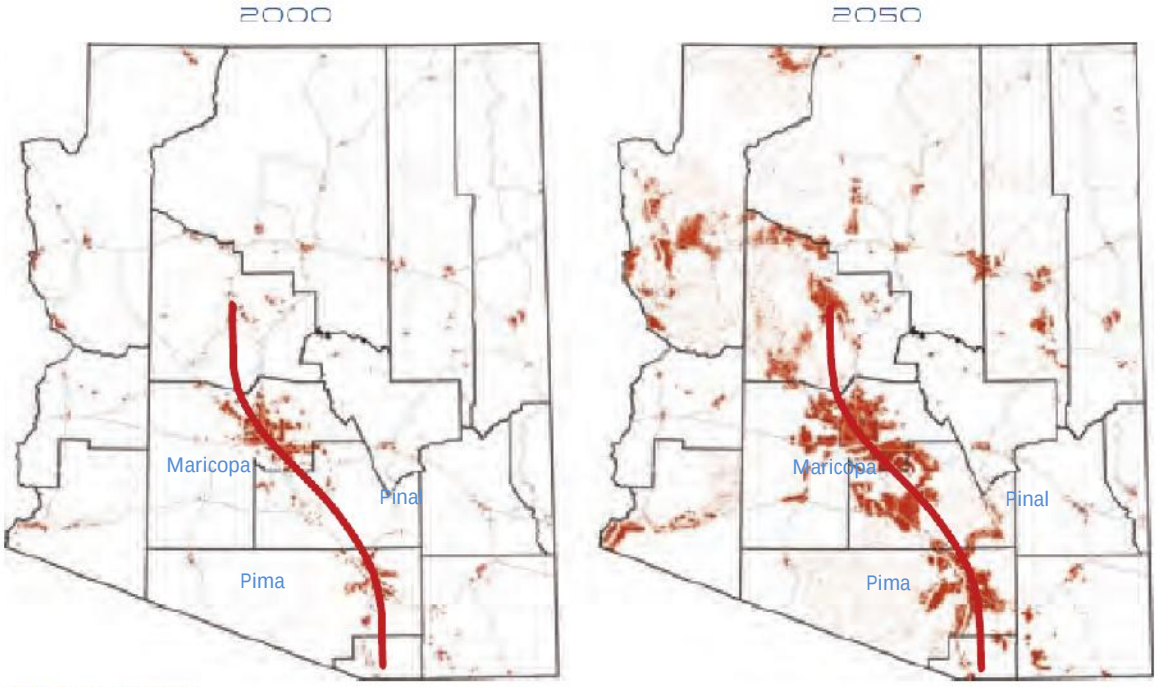
While Pinal County currently has the lowest population of the three counties in the study area, it is expected to add more people than Pima County between 2009 and 2050, and with more than 2.1 million people it is projected to be the second most populated county in the state.

Employment growth projections for the same three-county area in the next 40 years are even more dramatic. Forecasted employment growth in the Sun Corridor looks like:

- Maricopa County employment is projected to increase by 132 percent from 1,815,000 jobs in 2009 to 4,205,700 jobs in 2050
- Pima County population is projected to increase by 87 percent from 449,000 jobs to 834,500 jobs by 2050
- Pinal County employment is projected to increase by 850 percent from 110,000 jobs in 2009 to 1,044,700 jobs in 2050

The substantial "infill" of population and employment in Pinal County between the existing major urban areas will be distinguished by its focus on high-density activity centers in accordance with the region's long-range plans. The redistribution of employment and population towards the center of the Sun Corridor will exacerbate existing commuter mobility needs in the region. Within the 2050 planning horizon, daily travel to and from major activity centers in Pinal County from Maricopa and Pima Counties will add to the overall region's mobility needs. The overall increase in travel demand within the corridor will further tax an already capacity-deficient system. Figure 2 illustrates the projected change in population concentration between 2000 and 2050 in the Sun Corridor.

Figure 2. Projected Change in Population Concentration Between 2000 and 2050 in the Sun Corridor



Note: Populated areas shown in red.

Source: Morrison Institute for Public Policy, ASU; map adapted from Maricopa Association of Governments.

Current travel conditions are represented by the following:

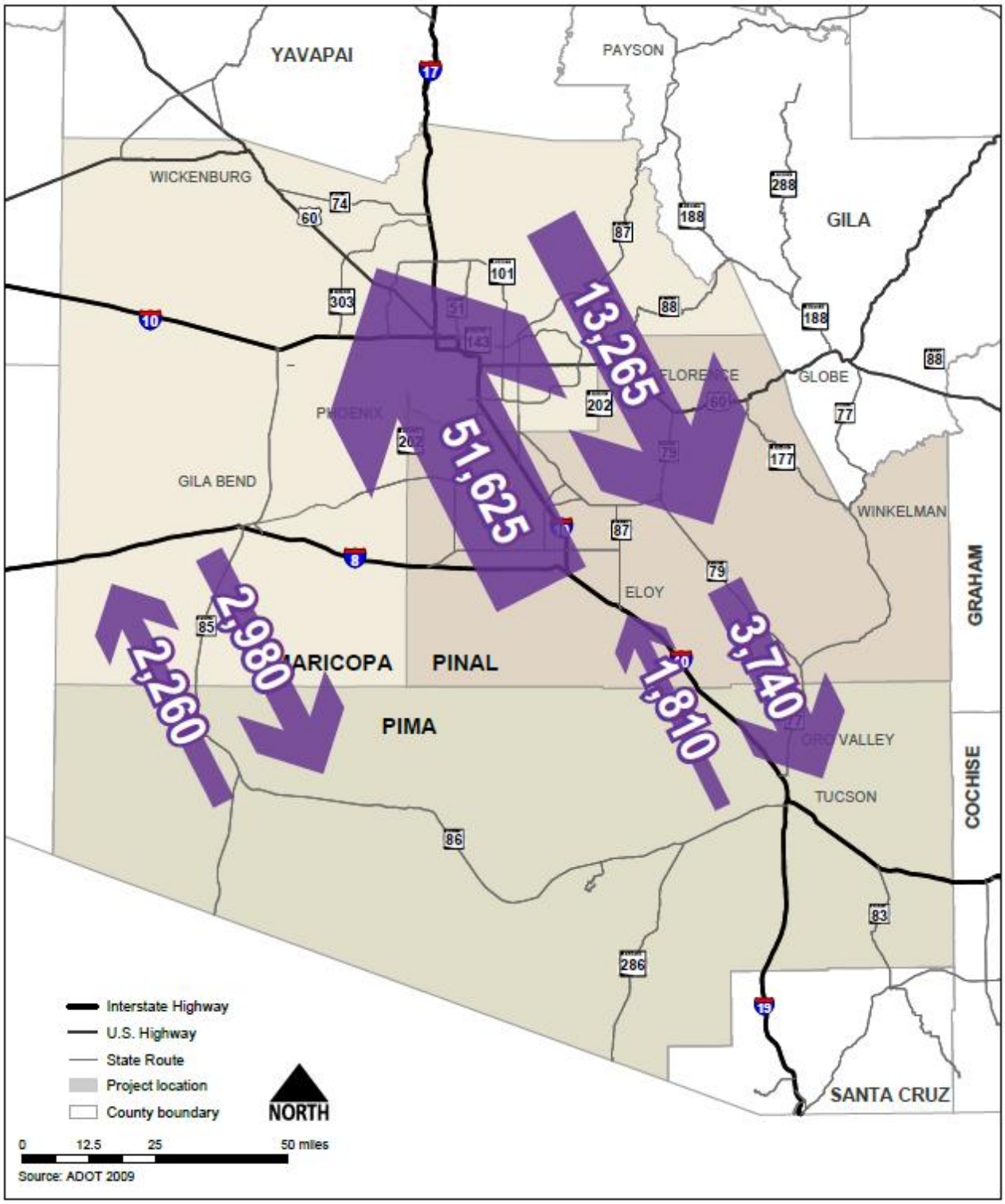
- Travel demand in the Sun Corridor historically has been significant. Based on a 2008 photo license plate survey of highway vehicles (automobiles, trucks, etc.) conducted by MAG and PAG, more than 51,000 daily trips were observed on two primary north–south roads in the study area, Interstate 10 and State Route 79. Twenty-two percent (22%) of the daily vehicle traffic on these roads completed a commute-type trip; same vehicle coming in at one location and going out at the same location.
- From 2006 to 2008, daily inter-county commute trips within the three counties exceeded 75,000 (Census Transportation Planning Package 2006-2008 [CTPP]). Daily commute trips from Maricopa County to Pima County numbered 2,980, and commute trips in the reverse direction numbered 2,260. The commute from Pinal County to Maricopa County represented about 68 percent of all the inter-county commute trips (51,625), with the second most desired trip (13,265) being in the reverse direction, between Maricopa and Pinal counties, representing about 18 percent of all inter-county commute trips.

- By 2050, as Pinal County's employment grows significantly, these last figures are expected to increase accordingly.

Figure 3 illustrates the general inter-county trip patterns identified through the CTPP data. The arrows on the map indicate direction of travel and volume between each county. The arrows are not shown to represent any specific alignment.

Given the need to span the entire Phoenix to Tucson Corridor with both intercity and commuter services, this high capacity project will address both elements together. This approach will ensure coordination in project definition and in the implementation and preservation of opportunities for rights-of-way, funding and plan compatibility along the selected alignment(s). The 120-mile corridor will be studied as an intercity route to address intercity needs in light of the limitations of additional highway expansion and the growing demand for more intercity travel between Phoenix and Tucson in the future. The intercity connection will also provide a foundation for commuter overlays in the urban areas that will be designed to grow as development, and the associated commuter demand, reaches into Pinal County. Commuter services can be expected to span the entire corridor within the forecast timeframe of this project. As noted earlier, by 2050, Pinal County's employment base will rival Pima County's and will establish a growing pattern of daily trip interchanges between Pima and Maricopa Counties and Pinal County.

Figure 3. Daily Inter-County Commute Trips



Source: CTPP 2006 to 2008

By evaluating both intercity and commuter needs simultaneously, all aspects of corridor services can be studied simultaneously with a single set of documents that will address the requirements of the affected federal agencies. The process for coordinating the individual requirements of the FRA and the FTA and how they relate to each other is shown in Table 4.

Table 4. Project Approach

Task	Proposed Approach	Response to Federal Process
Project Initiation	Publish a NOI for a Tier 1 EIS	Initiates a service level EIS process (FRA)
Problem Statement	Purpose and Need	Identifies the transportation need for intercity connectivity between Phoenix and Tucson (FRA) Identifies the transportation need for commuter mobility within Maricopa, Pinal, and Pima counties (FTA) The distinction between the demand for intercity connectivity and commuter mobility needs will be identified as part of this study through analyzing travel demand volumes, trip origin and destination, trip purpose, trip frequency, and time-of-day travel patterns
Alternatives	Prepare an Alternatives Analysis/Service Development Plan, supported by a Tier 1 EIS, that are compliant with FRA and FTA New Starts requirements	Review of a full range of Intercity alternatives including end of line locations within each urban area, potential route locations, and service development issues (FRA) Review of Commuter alternatives including a full range of mode options, connectivity scenarios, route locations, and travel market performance measures. (FTA)
Public and Agency Involvement	Conduct a Public Involvement Plan and Agency Coordination Plan which supports the decision of a Locally Preferred Alternative	Conduct public and agency outreach that meets the requirements of a Tier 1 EIS document including Public and Agency Scoping and Public Hearings (FRA) Follow a Public Involvement Plan that supports a New Starts AA study, and an Agency Coordination Plan that meets the requirements of SAFETEA-LU 6002. (FTA)
Deliverables	New Starts Alternatives Analysis Tier 1 Environmental Impact Statement Service Development Plan	FRA, FTA, and Local Approval
	Tier 1 ROD and LPA	
Next Steps	To be determined based on future funding strategy	

2.2 Existing Passenger Service Availability and Performance

Several modes of passenger service are provided in the Corridor including urban public transit, freight and passenger rail (Amtrak), common carrier (intercity bus), commercial aviation (intercity aviation) and ridesharing options. This section identifies the availability of these services and their performance (where available).

Urban Public Transit Services

Urban public transit services are provided in the Phoenix (Maricopa County) and Tucson (Pima County) metropolitan areas. Both areas are served by local and regional fixed route bus and commuter express bus service. A 20-mile light rail corridor is operated within the Phoenix region connecting the communities of Mesa, Phoenix and Tempe. There are no current fixed rail operations in Tucson excluding the heritage trolley; however, a funded 4-mile modern streetcar line is currently under development. The Phoenix and Tucson urban area fixed route bus and rail services board more than 86 million annual passengers (National Transit Database, 2009).

Commuter express bus service operates on the Interstate10 corridor in the Phoenix and Tucson urban areas. In both urban areas, the commuter express routes nearly extend to their respective shared county borders with Pinal County. In the Phoenix region, a public park-and-ride facility is located near Pecos Rd and Interstate 10 (near the southern boundary of Maricopa County). Based on a 2005 City of Phoenix commuter express passenger survey, Pinal County residents reported using the park-and-ride facility to access the City of Phoenix premium commuter express service on Interstate10 (I-10 East RAPID). Carrying more than 197,000 annual passengers, the I-10 East RAPID is the second most utilized commuter express bus route in the Phoenix region (Valley Metro 2010 Annual Ridership Report). Total annual commuter express ridership from the routes originating in the southeast area of the Phoenix metropolitan region (Ahwatukee, Chandler, Gilbert, Mesa, and Tempe) is over 665,000.

Public transit service in Pinal County is limited. No countywide services exist, and most available services are for senior and disabled residents. Transit service in the Corridor, therefore, is limited to such systems as the Cotton Express Service, a shuttle bus in the Coolidge area.

Freight and Passenger Rail

Union Pacific Railroad (UPRR) has rail lines carrying freight in the Corridor. It is currently double-tracking its transcontinental Sunset Route, which parallels Interstate10 within the southerly portion of the Corridor. Additionally, UPRR has proposed constructing a new rail yard in the Red Rock area at the southern end of the Corridor (UPRR 2010). UPRR has a second line in the Corridor that runs north from the Sunset Route along SR 87 into Coolidge, where it turns to the northwest and serves the Phoenix metropolitan area. The Magma Arizona and Copper Basin Railroads also have rail lines in the Corridor that serve mines to the east in Superior and Hayden. Amtrak provides passenger rail service on its Sunset Limited route. The Sunset Limited route begins in New Orleans, Louisiana and ends in Los Angeles, California. Passengers can access the service at two locations within the study area: Tucson (Pima County) and the town of Maricopa (Pinal County).

Common Carrier (Private Intercity Bus)

Private intercity bus is operated by two primary carriers: Greyhound Lines and Arizona Shuttle. Greyhound Lines operates eight (8) trips each weekday from Phoenix to Tucson, originating at the Greyhound terminal near Sky Harbor International Airport and terminating at the Greyhound Terminal near the western edge of Tucson's central business district. Nine (9) trips are operated each weekday between Tucson and Phoenix. Some trips currently are operated directly between the two terminals, while other trips have intermediate stops in either the City of Mesa (Phoenix area suburb), or the City of Casa Grande (Pinal County's largest incorporated community).

The Arizona Shuttle service operates 18 daily round-trips between Tucson and Phoenix. Three passenger stops are provided in the Tucson area: Speedway Blvd and Craycroft Rd (east Tucson area), Euclid Ave and 6th St (University of Arizona Campus), Ina Rd and Interstate 10 (north Tucson Area). The only scheduled stop in the Phoenix area is at Sky Harbor International Airport.

Vehicles operated by Greyhound Lines can accommodate up to 55 passengers per vehicle, while the Arizona Shuttle vehicles can accommodate up to 29 passengers per vehicle. Based on the total number of trips and maximum vehicle capacity, the scheduled daily intercity bus maximum passenger capacity between Phoenix and Tucson is 962, while the daily maximum passenger capacity between Tucson and Phoenix is 1,017. Performance data at the individual route level is not readily available for the private intercity bus operators.

Commercial Aviation (Intercity Aviation)

Intercity passenger aviation services are provided daily between Phoenix Sky Harbor International Airport (PHX) and Tucson International Airport (TUS) by one commercial provider: US Airways. Between seven (7) and ten (10) weekday trips are operated from PHX to TUS depending upon the day of the week, while six (6) to twelve (12) weekday trips are operated from TUS to PHX depending upon the day of the week. Most flights are operated using a Canadair Bombardier 90-passenger airplane, while one trip each weekday is provided with a 140-passenger Boeing 737 airplane. Based on the range of flights offered each weekday and the types of airplanes currently operated, the scheduled daily intercity aviation maximum passenger capacity between Phoenix and Tucson is 950, while the daily maximum passenger capacity between Tucson and Phoenix is 1,130, depending upon the day of the week.

Performance on the air passenger service is available through the United States Bureau of Transportation Statistics (BTS). Between January 2010 and December 2010, more than 198,000 passengers were transported between PHX and TUS, while more than 209,000 were transported between TUS and PHX. Average daily passengers (total divided by 365) is 545 and 574, respectively.

The existing all-day schedules offered by private motor bus and aviation providers demonstrates the current high demand for an alternative transportation solution to the automobile that offers a convenient, safe, and reliable alternative for intercity travel between Phoenix and Tucson.

Ridesharing

Public and private ridesharing options exist with the study area. These services include vanpooling and carpool ride-matching services. The largest public rideshare operator is Valley Metro in Phoenix. Valley

Metro coordinates vanpools that originate in and are destined to all three counties in the study area. Currently, there are 23 Valley Metro vanpools originating from Maricopa County (Phoenix region) destined for Pinal or Pima Counties. In addition, there are eight Valley Metro vanpools that originate in Pima and Pinal County, that are destined for locations within Maricopa County. The 31 total inter-county Valley Metro vanpools carry 327 person trips each work day.

The information provided within this problem statement demonstrates the need for both commuter and intercity transportation services within and throughout the study Corridor. Both needs will be addressed concurrently as the study progresses, with the intent that the deliverables reflect the requirements of both federal agencies in a combined set of documents that will satisfy FTA AA and FRA Tier 1 EIS/SDP needs.

3.0 TRAVEL DEMAND FORECAST METHODOLOGY

This section presents a brief description of the proposed methodology for conducting travel demand analysis for ADOT's Intercity Rail Study. A more detailed report describing the next generation of the Arizona Statewide Travel Demand Model (AZTDM) and its application to this study will be produced at a later date when all the planned model enhancements and refinements to the model are completed.

3.1 Background

The AZTDM was originally developed in 2009. The first version consisted of three modeling steps: trip generation, distribution, and auto assignment and utilized 1098 zones to represent the entire state of Arizona. The highway network used in the model was relatively coarse, consisting of major highways and expressways only. The urban areas were not modeled in detail. The trip generation rates used in the model were imported from other areas and as such, did not capture the specific characteristics of the state. The second generation of the AZTDM model (known as AZTDM-2) is currently in development. It contains a highly disaggregated zone system (6,000 zones) and a detailed highway network in both urban and non-urban areas. It also uses data from the National Household Travel Survey to generate state specific trip generation rates. The truck freight model is more refined and the external trip model also contains a number of enhancements. The model, however, still does not contain a transit mode choice model. Currently, the transit share is estimated using a set of pre-determined mode splits by area type and trip purpose.

3.2 Approach

A hybrid methodology will be used as part of a sketch planning approach to estimate the ridership projections for the initial evaluation of alternatives, as summarized in Table 5. This methodology will draw upon the outputs produced by the AZTDM-2 model (such as person trips, highway skims) and mode share data collected from various functioning rail systems in the country. For the final alternatives, a network based approach will be undertaken using the final version of AZTDM-2 model.

Table 5. Travel Demand Forecasting Process

	FRA Tier 1 EIS	FTA AA	Proposed Study Process
Travel Demand Forecasting	Identify/estimate existing and projected demand for all travel modes in the study corridor including auto, commercial air, bus, and rail. Calculate diverted trips and induced trips to estimate potential intercity rail demand.	Identify projected travel demand through transportation specific computer models calibrated to the performance of specific transportation modes using existing and projected local area socioeconomic data and other dependent variables.	Utilize a custom sketch planning computer assisted model for initial broad level travel demand forecasts. Supplement and verify sketch planning results using the FTA Aggregate Rail Ridership Forecasting model (ARRF). Develop final detailed travel demand forecasts using the fully calibrated Arizona Travel Demand Model (2nd version). This approach incorporates the general concepts of the FRA Tier 1 EIS process (existing travel demand for all modes, calculation of diverted trips, and calculation of induced trips) within a calibrated computer based travel demand model typically applied in FTA AA processes.

To supplement and verify the demand forecasts generated by the hybrid approach, the Consultant will apply the Aggregate Rail Ridership Forecasting model (ARRF) to a limited selection of potentially viable alternatives and produce line level demand forecasts. The ARRF model was developed by outside consultants for FTA to estimate "aggregate" ridership on rail lines (not station-specific boardings and alightings). ARRF is a sketch-planning tool consisting of CTPP 2000 data, GIS information, programs, control files, and a spreadsheet collectively used to develop an estimate of the ridership potential for a new rail system. ARRF is based on actual ridership for some 20 recently-built light and commuter rail projects. The consultant team will set up the ARRF model for the ADOT intercity rail project, project daily rail ridership on the alternative lines, and evaluate the ARRF ridership in relation to the projected ridership using the hybrid approach described above.

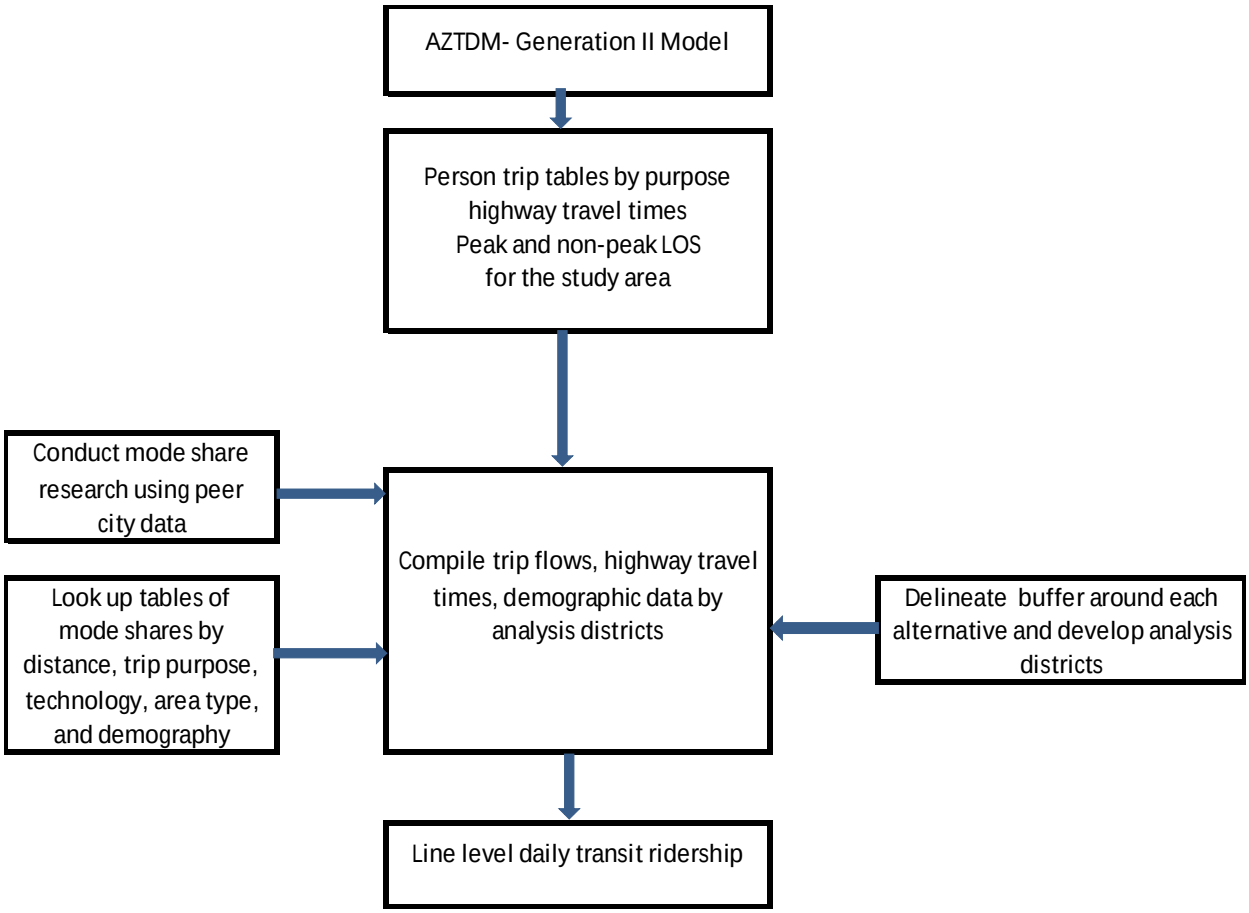
Figure 4 illustrates the different steps involved in the hybrid sketch planning approach. The first step is to analyze the outputs created by the AZTDM-2 model and compile the person trip flows, highway travel times, level of service data (for example, volume/capacity ratios) during peak and non-peak periods for the study area in the forecast year. Next, for each alternative that will be considered for screening purposes, a market area will be delineated along the alignment using land use, current highway and transit accessibility, and professional judgment. Once the market area has been delineated, it will be divided into convenient analysis districts using area type, city boundaries and land use. The person trip flows and travel time data collected in step 1 will be aggregated to the analysis districts.

The next step is the most important part of the sketch planning approach. It involves determining a reasonable mode share for each alternative. The mode shares will need to reflect the level of service provided, demography of the corridor served, technology used, and the type of travel market served. A detailed literature search will be conducted on well established rail and bus systems in the country and as much data as possible pertaining to ridership and service levels will be collected. Following is a list of statistics that will be collected:

- Route length
- Service levels (headways by time of day)
- General markets served
- Ridership by time of day (if available)
- Travel times
- Fares and fare collection system
- Number of stations and access modes
- Transit shares
- Vehicle type (technology) and vehicle capacity
- Station characteristics (shelter, real time arrival information etc)
- Socio-economic characteristics in the service area
- Guide-way characteristics (mixed right-of-way versus exclusive guideway)

Using the mode share data collected from the peer cities research, a lookup table of intercity mode shares classified by area type, distance of travel, rail technology, CBD connectivity, and size of cities served will be developed. The mode shares will be applied to the person trips in the analysis districts to estimate the transit demand.

Figure 4. Sketch Planning Approach to Estimate Ridership



Source: HDR Engineering, 2011

Additional statistics will be estimated to feed the operating and maintenance cost calculations. These statistics will include fare revenue, train miles, train hours, passenger miles, passenger hours and average trip lengths. The ridership projections for the final set of alternatives will be developed using the final version of the second generation AZTDM-2 model. It is assumed there would be roughly three build alternatives and one Baseline alternative in addition to a No-Action alternative.

The consultant team will conduct model runs for each build alternative, analyze output results in detail and summarize them in tabular form. The results will include system-wide ridership statistics, regional and corridor mode shares by trip purpose, rail boardings by station, average trip lengths, vehicle miles traveled, vehicle hours traveled, and estimates of emissions.

In order to fulfill the modeling requirements for this project, the consultant team would generate the necessary outputs from the model to support other planning and engineering components of this study including:

- Rail miles, rail hours, fleet size and peak loads;
- Ridership activity at intermodal interface locations (e.g., airports, bus and rail transit);
- Interpreting rail operations for modeling (e.g., station-to-station travel time and fares, service headways, passenger wait time);
- Travel time analyses;
- Sensitivity analyses of model input data (e.g., demographic forecasts, fare structures, auto operating costs);
- AM peak period, PM peak period, and daily rail segment passenger loads
- Station-to-station passenger flows;
- Rail volume-to-capacity analysis; and
- Air quality emissions analysis.

The travel demand methodology defined in this Project Initiation Package will be reviewed in detail with FTA and FRA staff at the appropriate time during the FTA AA and FRA Tier 1 EIS process. The final travel demand modeling methodology will be cooperatively refined with FTA and FRA with the intent that all final deliverables will reflect the requirements of both federal agencies in a combined set of documents that will satisfy both FTA and FRA needs. The methodology will be compliant with FTA detailed modeling requirements, which will also satisfy FRA travel demand estimation objectives. Coordination with Jim Ryan (FTA) has been initiated by ADOT personnel to ensure the Arizona Statewide travel demand model will meet FTA expectations for ridership estimations.

4.0 EVALUATION CRITERIA

The Arizona Intercity Rail Study will employ a three-tiered evaluation process designed to progressively cull the transportation modes/technologies, alignment, ends-of-line and station options under consideration for the transportation system between Phoenix and Tucson, Arizona. Each tier of the process will be more comprehensive, adding new criteria or progressively more refined definitions of the same criteria to assess each surviving alternative at a higher level of detail than the previous step in the process. The evaluation criteria and multi-tiered methodology are consistent with the FRA Tier 1 EIS process requirements for assessing beneficial and adverse environmental impacts associated with a reasonable range of alternatives. In addition, the criteria and methodology are consistent with the FTA AA process requirements for analyzing reasonable and promising alternatives based on a range of measures designed to understand each alternative's cost-effectiveness, financial feasibility, and potential fatal flaws. The evaluation criteria and methodology are designed to reduce the number of alternatives throughout the evaluation process as the criteria indicate that certain alternatives are found to be unreasonable. This is consistent with the objectives of the FRA Tier 1 EIS process and FRA AA process. Table 4 compares the evaluation criteria/methodology associated with the FRA Tier 1 EIS process, FRA AA process, and the proposed process for this study.

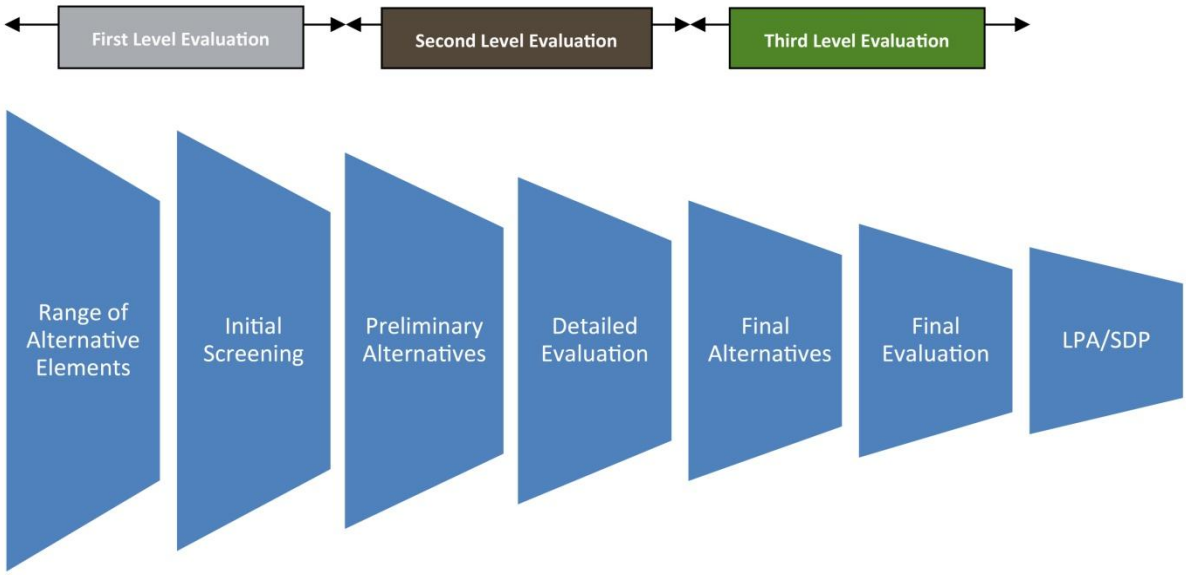
Table 4. Evaluation Criteria and Methodology

	FRA Tier 1 EIS	FTA AA	Proposed Study Process
Evaluation Criteria and Methodology	• Rail service alternatives and preferred type • Route alternatives and station locations • Service levels/frequencies • Capital project needs • Ridership/revenue forecasted • Operating costs estimated • Landscape level data collection and impact analyses. • Overall air and noise effects from train operations are considered • Conceptual engineering to approximately 5 % related to the SDP and supporting programmatic environmental analysis.	• Effectiveness - the extent to which alternatives solve the stated transportation problems in the corridor; • Impacts - the extent to which the alternatives impact --- positively or negatively - nearby natural resources and neighborhoods, air quality, the adjacent transportation network and facilities, land use, the local economy, etc.; • Cost effectiveness – the extent to which the costs of the alternatives are commensurate with their benefits; • Financial feasibility – the extent that funds required to build and operate the alternatives are likely to be available; and • Equity – that is, the costs and benefits of the alternatives are distributed fairly across different population groups	Evaluate alternatives in a progressive three-level assessment consistent with Tier1 EIS and the AA criteria, including cost-effectiveness, financial feasibility, and potential fatal flaws, including environmental impacts to generate a set of reasonable and promising alternatives to develop a recommended alternative/locally preferred alternative consistent with FRA Tier 1 EIS and FTA AA requirements. This process will be documented in a Final Evaluation Process Report which will be reviewed by both FRA and FTA.

Based on early screening of the alignments and the ends-of-line locations, alternatives will be developed that identify a beginning and end and a path between the two major cities. While some combinations will clearly not compete well in the process, no alignments or transportation modes/technologies will be removed prior to the completion of the Scoping process to ensure public and agency input has been considered in the decision.

Due to the alternatives addressing both intercity as well as commuter rail throughout the 120-mile corridor, the evaluation process will combine the FRA and FTA approaches to ensure all possibilities are considered in the analysis. The evaluation will be completed by the consultant team with oversight by ADOT. The process will be designed to address both intercity and commuter elements jointly based on the characteristics of each. An illustration of the evaluation process is provided in Figure 5.

Figure 5. Evaluation Process



First Level Evaluation – Initial Screening

The first level of criteria is relatively straightforward and is intended to determine a viable list of conceptual alternatives from a range or universe of choices postulated at the beginning of the project to cover a very broad array of possibilities. The intent is to address all reasonable alternatives to the proposed action including "No-Build", as provided for in NEPA, in preparing the FRA Tier 1 EIS and to ensure that the AA addresses all reasonable and promising alternatives to remain eligible under the FTA Section 5309 New Starts program as a project is defined for consideration in a Draft EIS under NEPA. At this level, applied following Scoping, the analysis will apply to individual elements that make up possible alternatives. These elements include:

- Corridor/route segments
- End-of-line locations
- Modal/technology options

The elements will be reduced to a manageable list to ensure the remaining alternatives, built from the remaining segments and ends-of-line locations are practical and allow the rest of the process to focus on realistic options.

The first level of the evaluation is a kind of fatal flaw assessment that will eliminate from further consideration those choices that do not meet the project Purpose and Need and which do not compare

favorably with other choices available. First level criteria will be applied sequentially to cull the list of options to a manageable set that can be developed more completely in the conceptual alternatives task under the Second Level Evaluation. Five general categories of criteria, consistent with FRA Tier 1 EIS and FTA AA processes, will be assessed at the first level:

- Mobility
- Community Acceptance
- Environment
- Safety
- Financial Feasibility

Examples of specific criteria associated with the general categories listed above are subject to review by stakeholders; however, the criteria could include length of the alignment (which has implications for cost and travel time), obvious infringement upon sensitive environments, existence of available rights-of-way (e.g., roads or tracks), and similar high level comparisons. For ends-of-line, the criteria include definition of a generalized "travel shed" of possible riders and the access options available. The first level analysis will be primarily qualitative though some measures will be quantitative in nature.

After eliminating segments (and the alignments containing them) and ends-of-line that are least able to meet the Purpose and Need for the project, a set of corridor length alignments will be developed connecting the remaining ends-of-line using the remaining segments. These will be identified as "conceptual alternatives" and will be given a unique identification.

In addition to the geographic definition of the conceptual alternatives, modal options will be addressed to identify choices that can meet the project Purpose and Need most effectively. Elimination of modes will likely rely on available information and prior analyses that cover how they perform within the corridor, leaving for further evaluation those that can address the corridor needs.

Second Level Evaluation – Conceptual Evaluation

Consistent with the requirements of both the Tier 1 EIS and the AA, the second level assessment will apply more detailed criteria to the conceptual alternatives that emerge from the first level evaluation. Each of the conceptual alternatives will be described and mapped individually at a level of detail that will aid in visual understanding of the alignment. Where practical, the evaluation criteria will be overlaid graphically on the alignment maps. In all cases, the results will be presented in a comparison matrix which will include criteria that will allow comparison of alternatives from both an intercity and a commuter travel perspective.

The second level criteria will provide additional filters to permit a more comprehensive evaluation of transportation service such as the ridership potential and potential station locations for each alternative. The second level assessment will also introduce a more extensive consideration of access modes, activities, population and employment within the ends-of-line and station areas. Examples of potential Level 2 criteria are provided below. These potential criteria are intended to demonstrate the level of analysis to be undertaken. Where possible, the second level evaluation will be quantitative, but results will most likely be presented as a comparative overview of the alignments based on a three-level range (e.g., +, -, no effect or ○, ●, □).

- Route length
- Service levels (headways by time of day)
- General markets served (e.g., intercity and commuter)
- Ridership by time of day (if available)
- Safety
- Travel times
- Right-of-way availability
- Compatibility with existing rail operations
- Revenue potential
- Stations
- Access modes
- Transit shares
- Station characteristics (shelter, real time arrival information etc)
- Socio-economic characteristics in the service area
- Compatibility with community land use and transportation plans
- Environmental Impact
- Environmental Justice
- Project Capital and Operating Costs
- Traffic impacts

Third Level Evaluation – Final Evaluation

Following the second level assessment, a conceptual engineering level analysis will potentially be used to define the "final alternatives." These are the alternatives from which a LPA will be selected. For this step, each alignment will be mapped at 1":400' scale to clearly indicate impacts on land uses and sensitive environments. The higher level of detail at this level is developed to ensure a more comprehensive identification of impacts and opportunities for each alternative so they present a complete and compliant understanding of the effects of the project under NEPA requirements for the Tier 1 EIS and clearly reflect the effects of the choices in the environmental review in the AA.

The criteria in the third level are more detailed and have a greater emphasis on operational needs so they could change depending on the alignments. Examples of potential third level criteria are described in Table 5.

Table 5. Examples of Third Level Criteria

	Factors
Transportation/Mobility Factors	Travel time Reliability Safety Connectivity Sustainable capacity Passenger cost Ridership Travel time benefits/project passenger mile Operating cost/passenger mile Cost/hour of travel time saved
Performance Factors	System design criteria System capabilities System capacity Corridor services Regional pollutant emissions Energy consumption
Alignment & Station Factors	Low-income household served Employment near stations Existing land use Transit supportive plans and policies Maximize ridership and revenue potential Maximize connectivity and accessibility Minimize operating and capital costs Maximize compatibility with existing and planned development Minimize impacts on natural resources Minimize impacts on social and economic resources Minimize impacts on cultural and parks/wildlife refuge resources Maximize avoidance of areas with geologic and soils constraints Maximize avoidance of areas with potential hazardous materials

The proposed evaluation criteria defined in this Project Initiation Package will be reviewed in detail with FTA and FRA staff at the appropriate time during the FTA AA and FRA Tier 1 EIS process. The final evaluation criteria used will fulfill the intent that all final deliverables reflect the requirements of both federal agencies in a combined set of documents that will satisfy FTA AA and FRA Tier 1 EIS/SDP needs.

5.0 DESCRIPTION OF CONCEPTUAL ALTERNATIVES

In coordination with ADOT a reasonable set of alternatives will be developed for consideration in the AA/Tier 1 EIS process, to include alternatives consistent with the following descriptions:

1. No-Build alternative (per NEPA requirements)
2. Transportation System Management alternative (per FTA New Starts requirements)
3. Build alternative(s)

It is assumed that the universe of alternatives (i.e., range of alternatives) currently under consideration will be filtered down to a practical set of alternatives (initial screening level) to be evaluated in the AA/Tier 1 EIS process relying on the statement of purpose and need, goals and objectives, previous related studies, and input that may arise through the public involvement and scoping processes. ADOT and the study consultants will work to better define the compatible local transit systems that would serve as a complement to the Build Network. Table 6 describes the alternatives analysis process.

Table 6. Alternatives Analysis Process

	FRA Tier 1 EIS	FTA AA	Proposed Study Process
Alternatives	Identify all reasonable passenger rail alternatives including a no-action alternative.	Identify a range of reasonable and promising alternatives including a no-action (No-Build) alternative, one or more fixed guideway alternatives (build alternatives), and a transportation system management (TSM) alternative [TSM is defined as the best an agency can do without a guideway investment]. Alternatives include a range of corridors and public transportation modes.	Identify all reasonable and promising alternatives including a no-action alternative, a TSM alternative consistent with FTA AA and New Starts objectives, and a set of build alternatives that consider a range of transportation modes and corridors, including reasonable intercity passenger rail alternative(s) consistent with NEPA and FRA transportation objectives.

In coordination with ADOT, a range of conceptual alignments by segment, alternative ends-of-line, and modes/technologies have been proposed for inclusion in potential build alternatives. The range of conceptual alignment alternatives has been identified in previous plans and studies; however, the concepts will be further defined during Scoping and Level 1 evaluation. Build alternatives could potentially include the pairing of any combination of segments and ends-of-line to define an overall alignment. Figures 6 and 7 illustrate the initial set of potential alignment segments that have been suggested in previous studies. The map has been split into a two figures (north and south) to provide a greater level of detail, the width of the corridors reflects the study area boundaries suggested by previous or on-going studies.

Multiple technologies/transportation modes will be analyzed as part of the AA/Tier 1 EIS process to determine an efficient, effective, and locally appropriate transportation solution. Initial technologies/transportation modes under consideration include intercity/express bus, light rail transit, commuter rail, intercity rail, and high speed rail. Each of these modes has different applications and may not be appropriate for all corridor segments under consideration. Additional modal concepts may be considered depending upon input received during the project scoping process.

The initial conceptual alternatives presented in this Project Initiation Package will be refined as the study progresses to fulfill the intent that all final deliverables reflect the requirements of both federal agencies in a combined set of documents that will satisfy FTA AA and FRA Tier 1 EIS/SDP needs.

Figure 6. Initial Potential Alternative Alignment Segments (North Area)

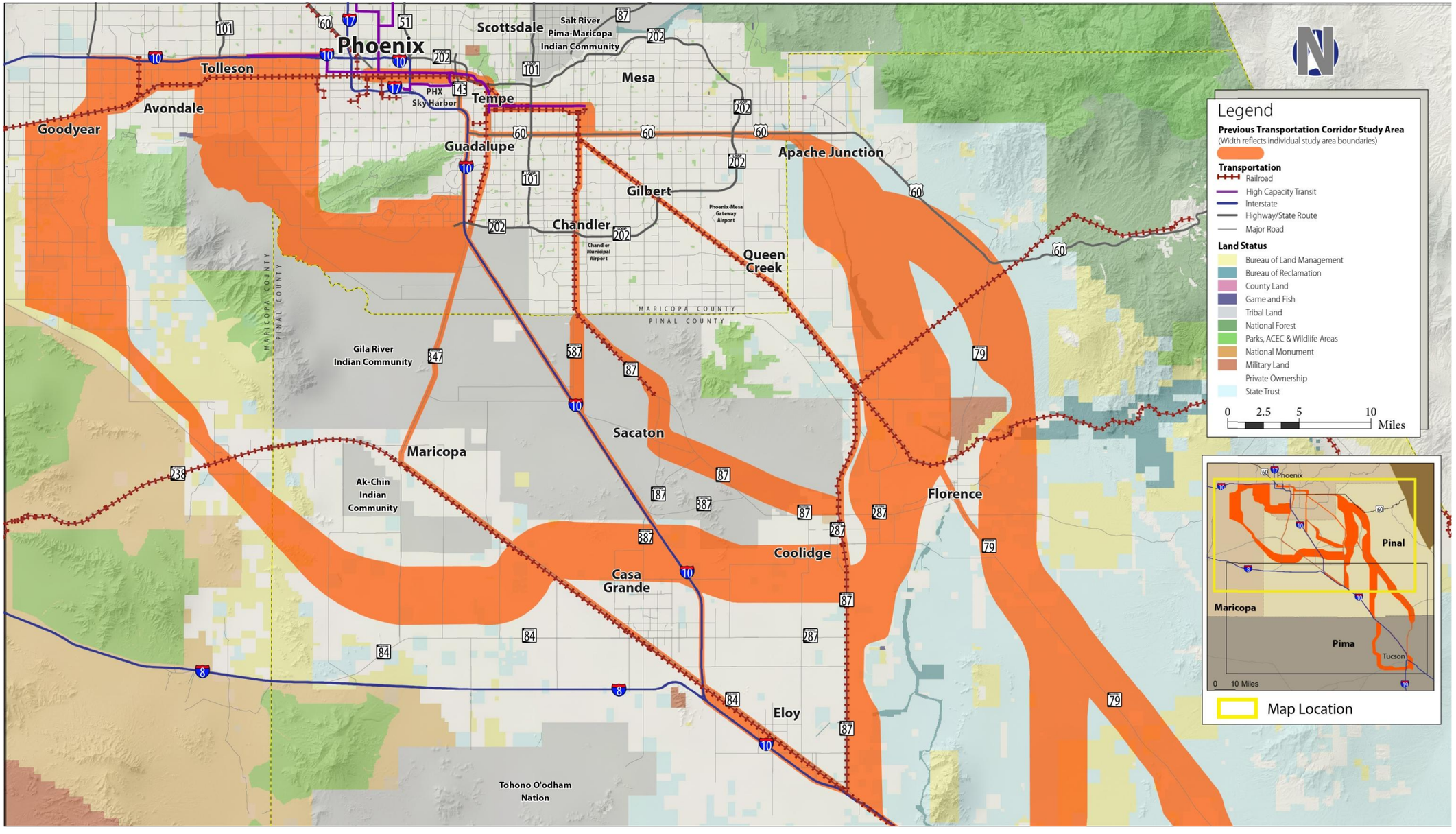
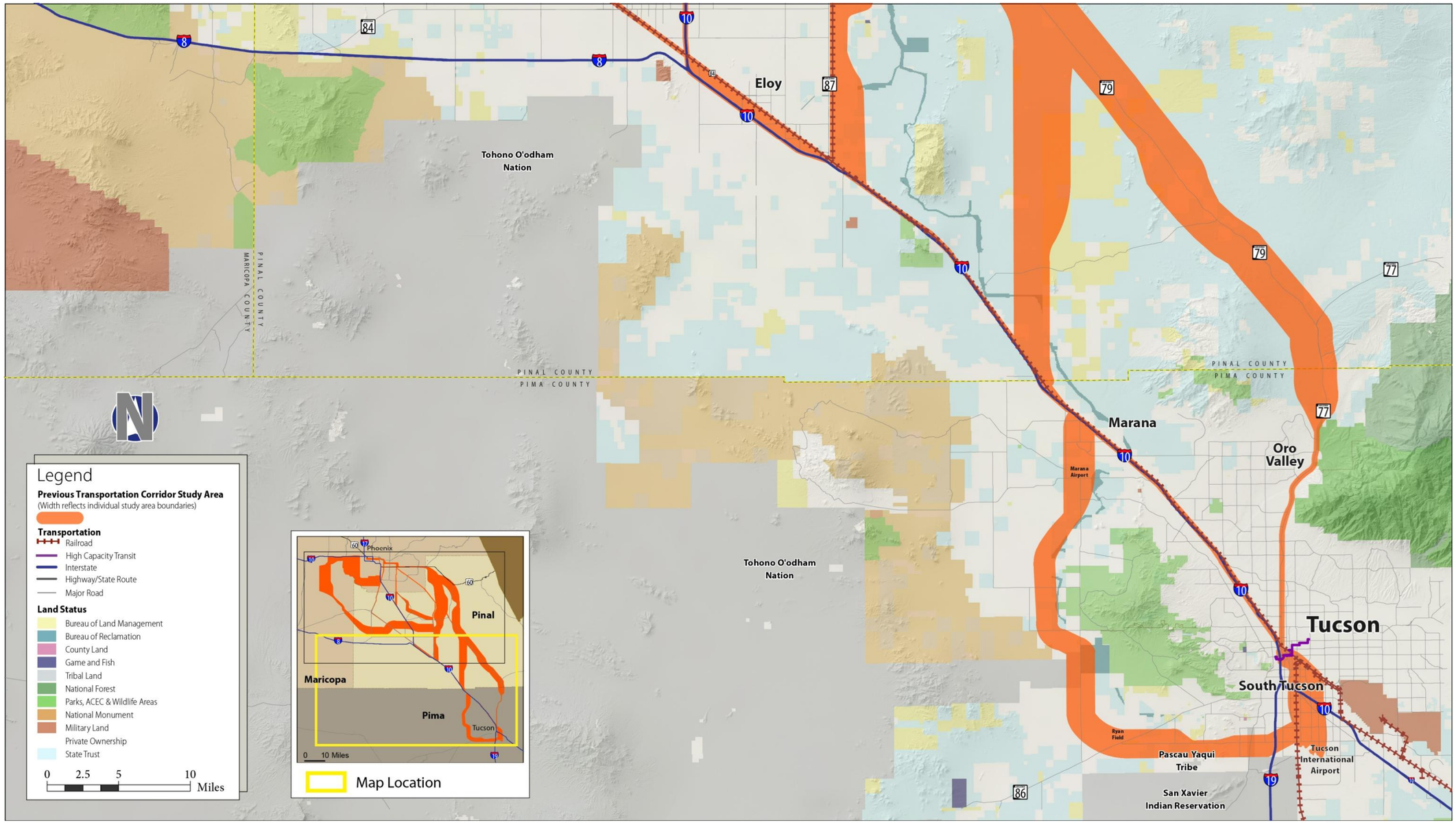


Figure 7. Initial Potential Alternative Alignment Segments (South Area)



6.0 SCHEDULE

The preliminary schedule for this study follows. Currently, Scoping is anticipated in late Summer 2011, while preparation of the AA Environmental Review/Tier 1 Draft EIS and selection of an LPA is expected to occur in mid 2012. A preliminary project schedule is provided in Figure 8.

Figure 8. Preliminary Project Schedule